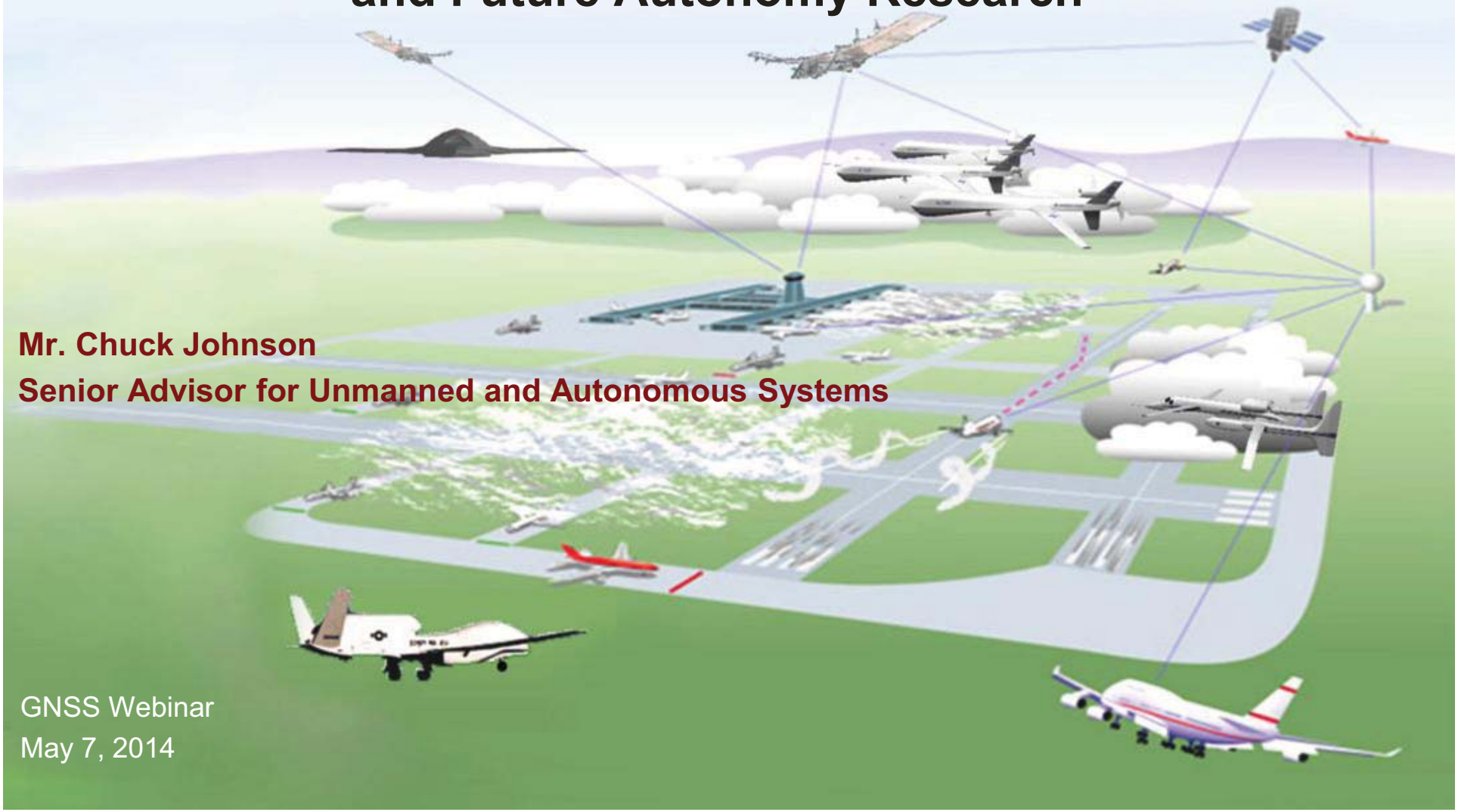
National Aeronautics and Space Administration

UAS Integration in the NAS Project and Future Autonomy Research



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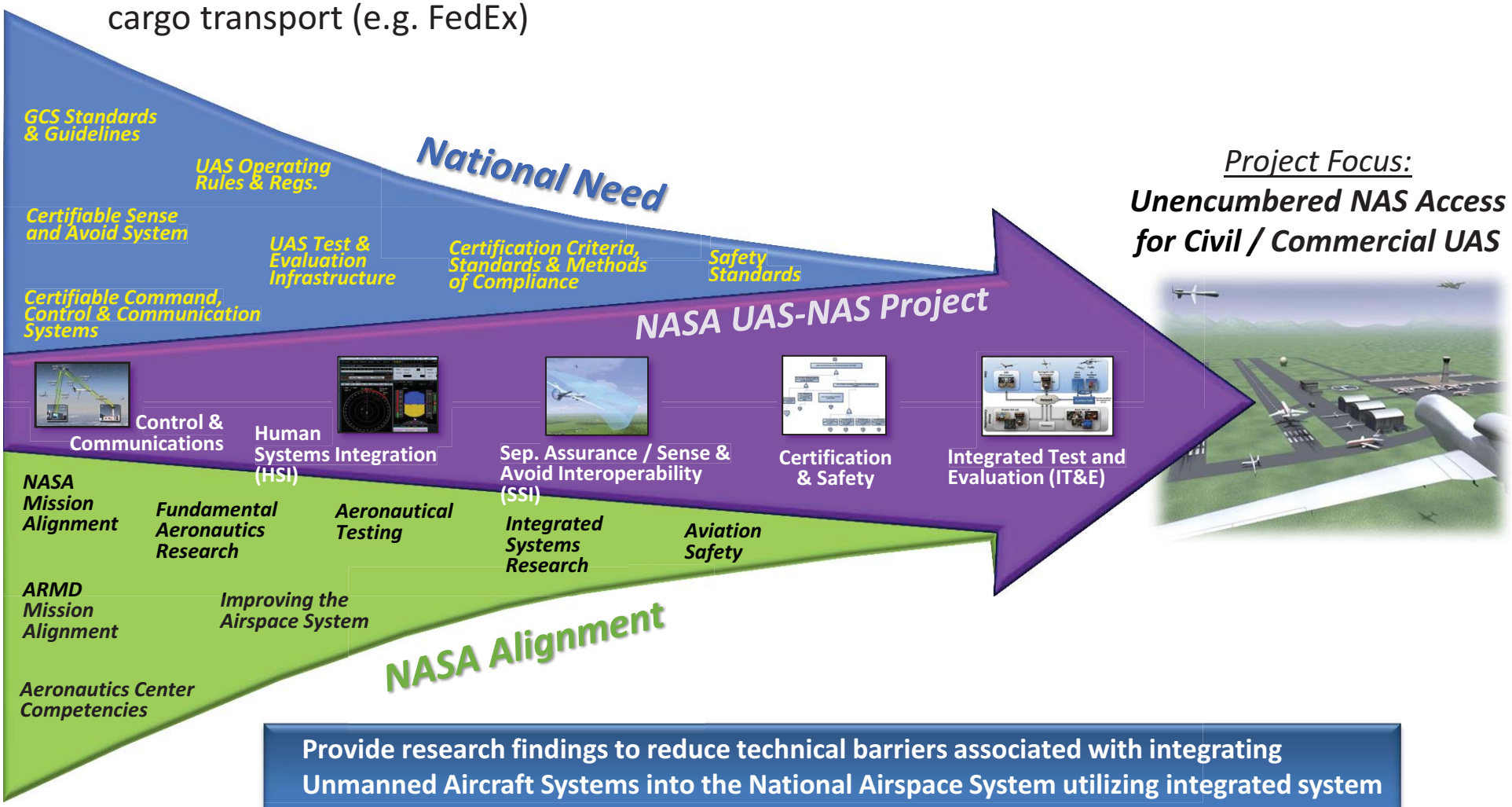
GNSS Webinar
May 7, 2014

Developing the UAS-NAS Project

There is an increasing need to fly UAS in the NAS to perform missions of vital importance to National Security and Defense, Emergency Management, and Science. There is also an emerging need to enable commercial applications such as cargo transport (e.g. FedEx)



Project Focus:

Unencumbered NAS Access for Civil / Commercial UAS

Provide research findings to reduce technical barriers associated with integrating Unmanned Aircraft Systems into the National Airspace System utilizing integrated system level tests in a relevant environment.

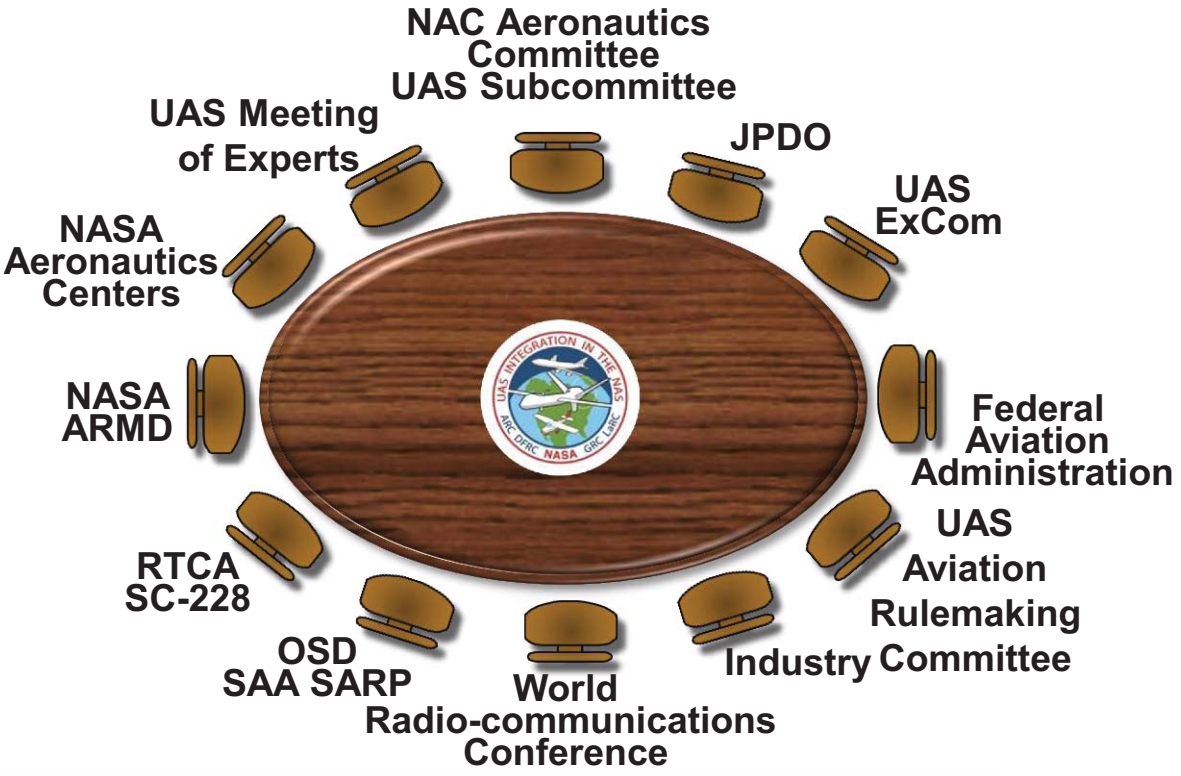
UAS-NAS Project Formulation

Key Stakeholders and Influencing Factors

Project Focus:

Unencumbered NAS Access for Civil / Commercial UAS

Groups Working on the Problem



The NASA UAS-NAS Project is influenced by several key stakeholders within the UAS Community which helped guide it's formulation

FAA Pathway to UAS Access

- The FAA is using several domestic forums, in conjunction with several international forums to lay out the pathway for their priorities and investments.
  - If work is conducted outside of the pathway, the FAA may be unwilling to collaborate

Chartered to develop DAA and C2 MOPS

Joint Planning & Development Office (JPDO): Forum where collaboration for NextGen research occurs across gov't agencies and industry

UAS Executive Committee (ExCom): Senior gov't steering group focused on streamlining public UAS access

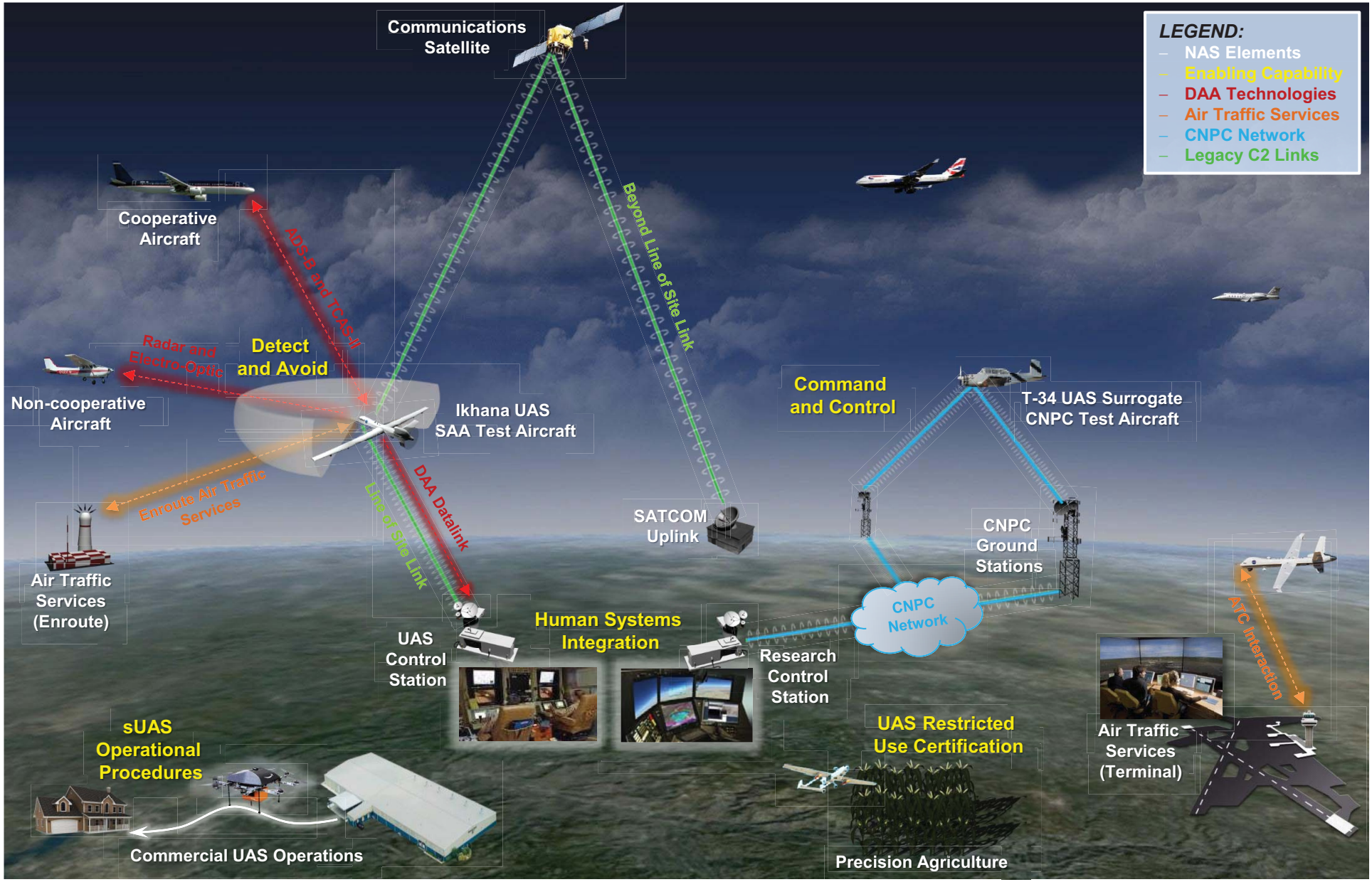
World Radio Conference and International Civil Aviation Organization (ICAO) UAS Study Group are addressing UAS access from an international perspective

UAS Aviation Rulemaking Committee (ARC) Developed civil UAS Implementation Plan based on the FAA's UAS CONOPs & Roadmap

OSD SAA Science and Research Panel (SARP): Chartered by OSD to identify SAA Research Gaps

NASA has a leadership role within each of these forums

UAS-NAS Project OV-1



UAS-NAS Technical Challenges

TC-SAA

SAA Performance Standards

- Provide research findings to develop and validate UAS Minimum Operational Performance Standards (MOPS) for sense and avoid (SAA) performance and interoperability.

TC-C2

C2 Performance Standards

- Provide research findings to develop and validate UAS Minimum Operational Performance Standards (MOPS) for terrestrial command and control (C2) communication.

TC-HSI

Human Systems Integration

- Provide research findings to develop and validate human systems integration (HSI) ground control station (GCS) guidelines enabling implementation of the SAA and C2 performance standards.

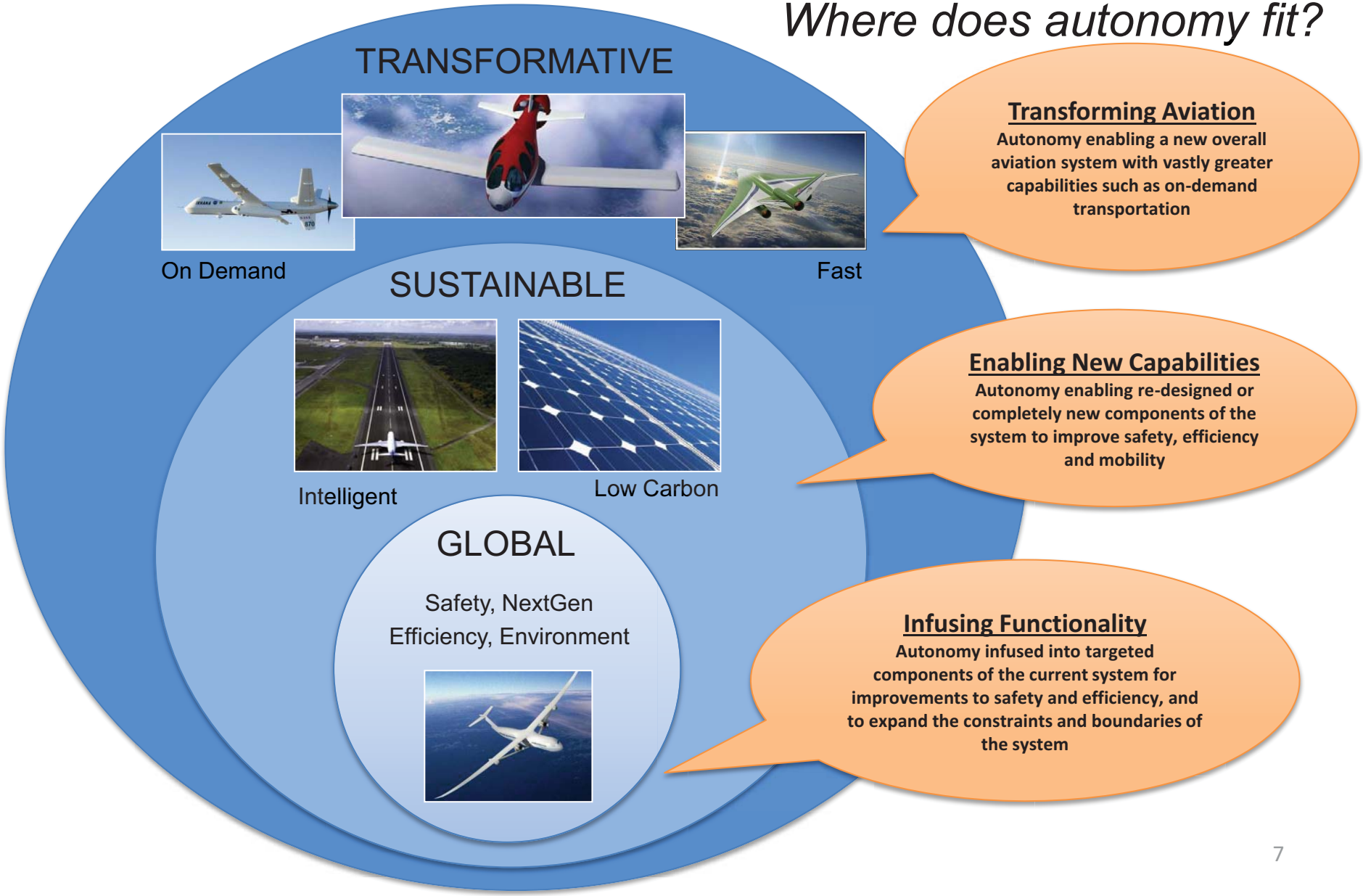
TC-ITE

Integrated Test and Evaluation

- Develop a relevant test environment for use in generating research findings to develop and validate HSI Guidelines, SAA and C2 MOPS with test scenarios supporting integration of UAS into the NAS.

NASA'S Vision for Civil Aviation

Where does autonomy fit?

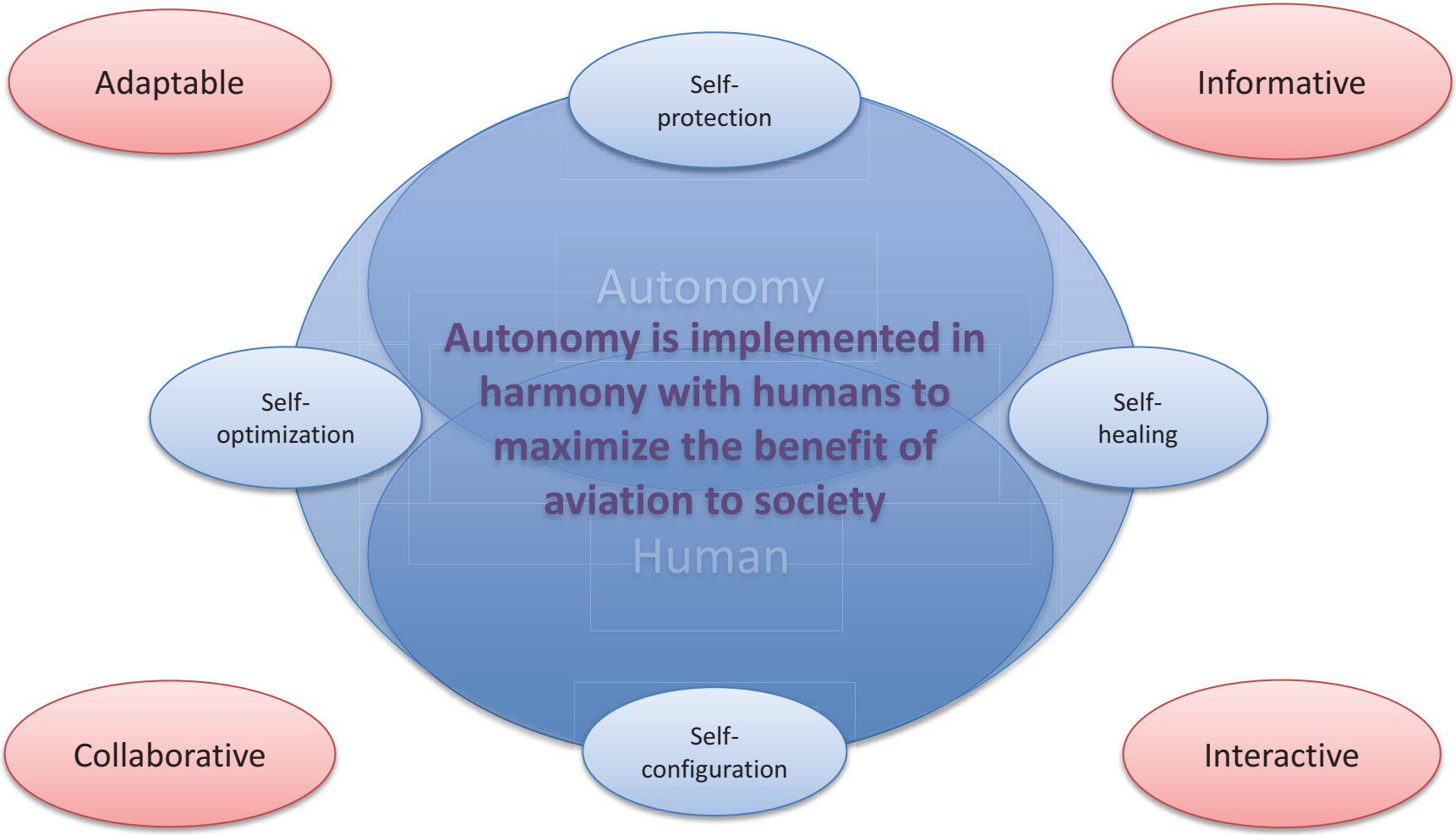


Transforming Aviation
Autonomy enabling a new overall aviation system with vastly greater capabilities such as on-demand transportation

Enabling New Capabilities
Autonomy enabling re-designed or completely new components of the system to improve safety, efficiency and mobility

Infusing Functionality
Autonomy infused into targeted components of the current system for improvements to safety and efficiency, and to expand the constraints and boundaries of the system

NASA's Vision for Autonomy in Civil Aviation



Autonomy Strategy Framework

Vision

Autonomy is implemented in harmony with humans to maximize the benefit of aviation to society

Needs

Technologies & Applications

Develop archetypal / model autonomy standards, technologies, functions and mission applications to broadly enable innovation

Trusted Systems Integration

Address the challenges associated with trust between humans and autonomous systems

Architectures, Methods & Metrics

Develop architectures and meta-design tools that enable the efficient and effective creation of joint human-machine cognitive systems

Real World Testbeds

Establish relevant testbeds for testing autonomous systems

Challenges

Technical (Research to Enable)

Issues such as human-machine collaboration, TEV&V, machine reasoning, sensor integration, etc.

Socio-Policy (Research to Inform)

Issues such as liability, public acceptance, moral decision-making, transformation of human roles/tasks, etc.